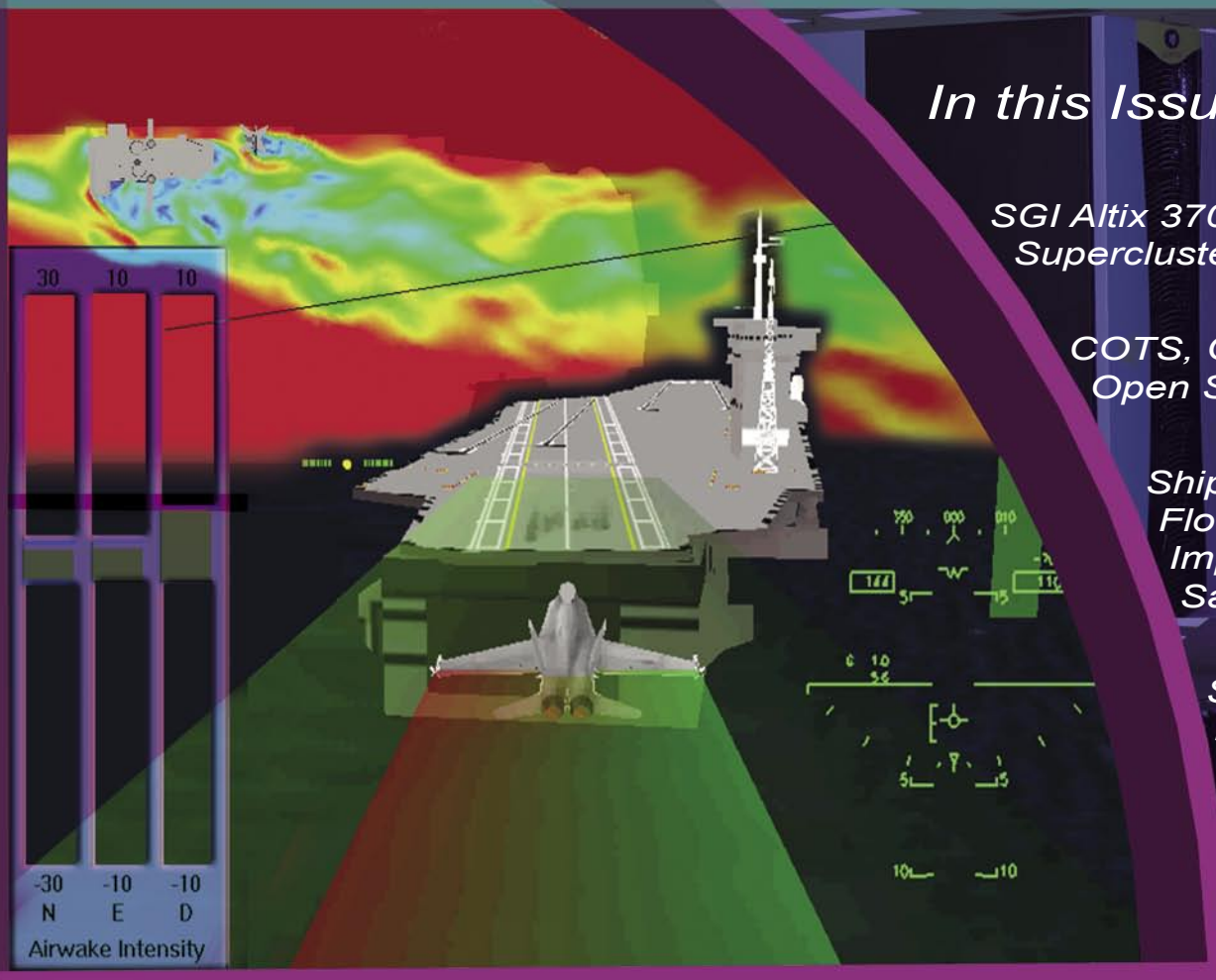
SPRING 2005

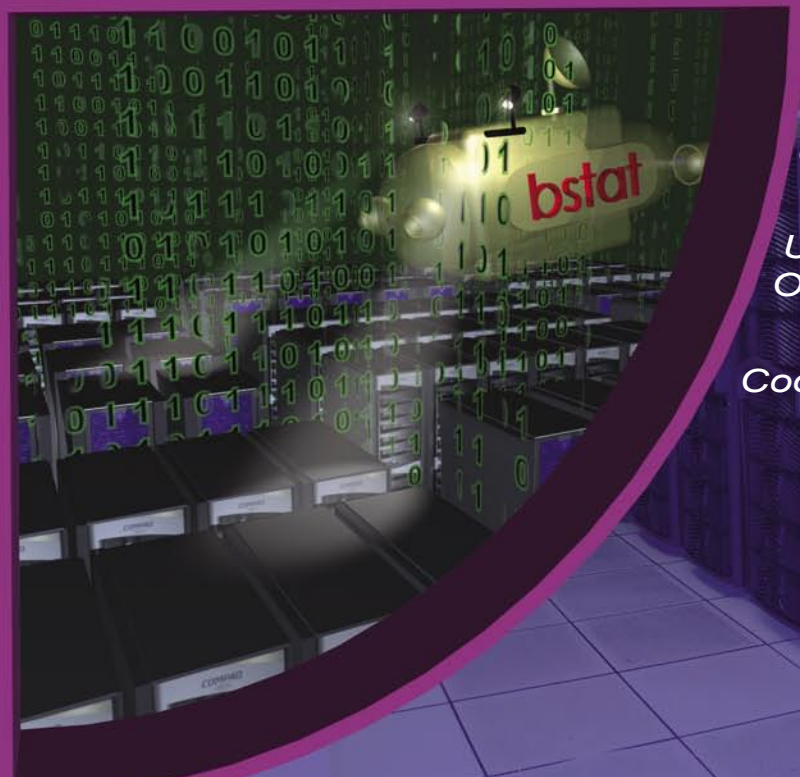
AERONAUTICAL SYSTEMS CENTER

MAJOR SHARED RESOURCE CENTER

Wright Cycles



In this Issue...



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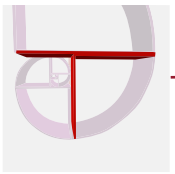

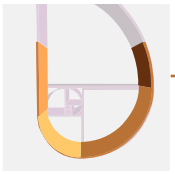

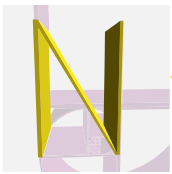

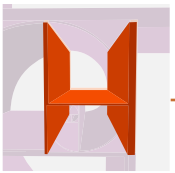

About the cover: Created by Chuck Abruzzino, multimedia specialist at the ASC MSRC, the central graphic was created using a mathematical formula from a golden rectangle. The series of repeating shapes, like the nautilus shell, grows by duplicating the geometric shape. The same shape is scaled up as each growth step is created. This replicating shape offers a unique graphic that is used to introduce the different sections in this issue.

Director's Desk

It is my distinct pleasure to continue as Director of the ASC MSRC and to provide this opening article for our Spring *Wright Cycles* Journal.

Our ASC MSRC mission is to "Diversify customer base through delivery of premier and innovative services." This issue of *Wright Cycles* is replete with evidence showing how we are achieving all aspects of this mission.

In this issue, you'll read about our huge and exciting gains as a result of Technology Insertion '05. We've initiated strategic collaborative projects with the United States Joint Forces Command (USJFCOM), the Air Force Research Lab Information Directorate (AFRL/IF), and most recently, with DOE and NASA. We're working hard to provide each user with a top-notch quality of experience, while enhancing the best HPC center staff in the land!

What you won't read about are some significant activities that the ASC MSRC is working with great energy and vigor, but which should be entirely transparent to our customers. We are realigning this HPC function from ASC into AFRL. We're very excited by this opportunity, primarily because AFRL plans a much-expanded role for HPC! The timing and a myriad of other "details" are yet to be finalized; however, look for updates in future editions of the *Wright Cycles*.

Another "behind the scenes" activity is our struggle with the constraints presented by our facility. The HPC systems that are emerging are massively more powerful than those of even one year ago. What the user does not see is how we struggle with the physical footprint, weight, cooling, and power requirements of these monsters. It is a daunting task to accommodate them, but we are working the near- and longer-term implications.

But don't let any of that keep you awake at night - our dedicated staff is up to the task! As always, we are striving mightily to keep the user #1. We're staying on the leading edge of technology and pumping out innovative solutions, while listening and responding to the voice of the customer.

We truly appreciate your comments and feedback to help us constantly improve. I invite you to drop a comment to me or the MSRC at-large (asc.hp.outreach@wpafb.af.mil) or even to open a dialog on any issue. Your comments and thoughts help us work toward our objective of becoming more intimate with our customer.

On another note, I want to extend my gratitude to Mr. David Rothery, SES, who served as the Director for our MSRC's parent organization, the Advanced Computational Analysis Directorate. Mr. Rothery is retiring after 38 years of dedicated service in various positions to the US Air Force. We wish him well in his new endeavor!

Thank you for picking up our Journal!

Steven J. Wourms
Director, ASC MSRC

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Director, ASC MSRC

Final TI-05 System Announced

In addition to the SGI Altix 3700 Supercluster that arrived in April (see article on page 2), the final piece of our TI-05 procurement was recently announced by the HPCMPO.

An HP 2048 Opteron processor Linux Cluster system is scheduled to arrive at the ASC MSRC in early fall. Look for full details in the next edition of *Wright Cycles*, or visit our website at www.asc.hpc.mil.

Solve Challenging Problems with the Latest Technology

By Jeff Graham

So, you're working in the laboratory to solve problems concerning aircraft survivability or issues with creating the next best composite material or designing tomorrow's breakthrough in propulsion systems for fighter aircraft. Just think about how far you would get modeling your challenging problems on your desktop PC or laptop. Not enough horsepower? Imagine just a little more and consider what you could do with access to a system that brings the power of over 2,000 desktop systems to your fingertips. Then ask yourself, "Why do I have to imagine all this when this is precisely the capability that the ASC MSRC installed in April to help researchers solve complex physics problems?" With such a system, DoD researchers can pump out several billion operations every second to solve the most challenging issues in developing tomorrow's weapon systems TODAY.

The SGI Altix 3700 Bx2, the latest model to join the highly successful SGI Altix family of servers and supercomputers, delivers twice the bandwidth and processor density of its flagship high-end model. The new Altix 3700 Bx2 model makes it easier for users to cost-effectively deploy the world's most powerful system, delivering more compute power while requiring less space.

The System to Make Your Imagination Take Flight

Today's latest and greatest technology is available now at the ASC MSRC with the recently installed SGI Altix computer system. Following an aggressive acquisition, the DoD selected the SGI Altix 3700 Supercluster with 2,048 1.6 GigaHertz Intel Itanium processors, that can be programmed to work together to tackle tremendously complex research problems. All together, the system provides 2 Terabytes of memory and 128 Terabytes of disk space. The SGI NUMAlink design will allow all the memory to be globally addressable by any processor in the system. Tools, such as Intel C, C++, and Fortran compilers, give researchers the advanced, but usable environment that most researchers could only dream about until now.

The ASC MSRC "Full Service" Commitment Can Help You Take Off

I know what you are thinking -"What good does this do me?" This is the fancy parallel programming every teenager knows something about, while many of us get lost navigating the daily email trail! That's where the "full service" resources offered by the ASC MSRC come into play with its experienced user support personnel. In-depth application specialists for Commercial Off-The-Shelf (COTS) software packages (such as MATLAB and ABAQUS); Ph.D.-level computational scientists; peripheral visualization and programming productivity tools; as well as a wealth of experience and expertise, all combine to help make the user productive on ASC's supercomputers.

Where Do I Sign Up?

If you get excited about modeling tomorrow's war winning capabilities and putting them in the hands of our brave men and women in the Armed Forces, then here's how you can begin. Get started today by contacting the ASC MSRC Service Center at msrchelp@asc.hpc.mil, (888) 677-2272 or (937) 255-1094, or visit our website at www.asc.hpc.mil. If you have used ASC MSRC resources (or other DoD HPCMP systems) in the past, contact your friendly Service/Agency Approval Authority (S/AAA) and ask for an allocation on the new SGI Altix system.

Today's technology is waiting for you. The staff at the ASC MSRC is here to help you make your imagination take flight!

Secure Launcher Protects Software on HPCMP Systems

By Jason Stare

The ASC MSRC has teamed up with the Software Protection Initiative (SPI) to test new methods for protecting sensitive and restricted applications. Under the direction of Dr. Charles Holland, the Deputy Under Secretary of Defense for Science and Technology, the SPI focuses on protecting critical DoD application software from piracy, tampering, and reverse engineering. The Anti-Tamper Software Protection Initiative (AT-SPI) Technology Office was designated as the Office of Primary Responsibility (OPR) and is responsible for developing software protection technologies, supporting the insertion of these technologies into application software, and providing education to the DoD on related policies or processes. Essentially, they want to make it more difficult, if not impossible, for the "bad guys" to make use of software copied from your system without your permission or knowledge.

In an effort to improve the overall security posture, we recently began testing a highly scalable product that can protect numerous applications with virtually no impact to the user. This new technology, called Secure Launcher, uses a combination of software and hardware technologies to apply protections at the executable level. The technology enables Software Protection Center (SPC) personnel to rapidly apply a layer of protection without modifying your application. This means there is no change to your application's performance and no chance to introduce bugs. The only change you will see is when you start your application, there will be an initialization period during which Secure Launcher authorizes the running of the application.

This technology virtually locks the executable to a preconfigured system, preventing unauthorized copying, modification or distribution of your application. If the application is copied and moved onto a different system, it simply will not run. The protection technology also defends against reverse engineering attempts or other unauthorized use of critical DoD technology.

The ASC MSRC has completed the initial test phase of the Secure Launcher and verified that the applications run properly. After carefully measuring the initialization and runtimes to ensure that there is no impact, the ASC MSRC staff verified that Secure Launcher-protected applications cannot run on an unauthorized system.

The Anti-Tamper Software Protection Initiative (AT-SPI) Technology Office is responsible for developing software protection technologies, supporting the insertion of these technologies into application software, and providing education to the DoD on related policies or processes.

The next step is to deploy this technology in an actual operational environment, approaching application developers who may be interested in having this level of protection for their applications. Our hope is that the entire process will be virtually transparent to the user community.

The Secure Launcher provides an additional layer of security for critical application software residing on HPCMP systems. Our testing and fielding of this technology demonstrates the DoD's commitment to protecting your critical application software. The Secure Launcher, in combination with local security measures, provides a rock-solid defense against the unauthorized copying, modification, and distribution of your sensitive and restricted applications.

For more information about Secure Launcher at the ASC MSRC, please contact the ASC MSRC Service Center at msrchelp@asc.hpc.mil, (888) 677-2272 or (937) 255-1094.

SciVis Enhancements Benefit the HPC User

By D. G. Adams

The Scientific Visualization (SciVis) laboratory recently completed a major upgrade to enhance its capabilities to support users. The upgrade includes more physical space for the lab, new display and presentation capabilities, improved data transfer capability, and additional software.

Meeting the Need

The SciVis lab responds to the needs of the ASC MSRC user community to better visualize the increasingly large and complex data sets. It does this by relying on proven high-speed graphic workstations from SGI and combining innovative display technologies with commodity-based graphics hardware. The SciVis lab is meeting the need for efficient and direct access to the user's data by connecting Linux workstations to the ASC MSRC high-speed network. The network provides direct access to data that is either developed on the HPC platforms or ported to the ASC MSRC via electronic transfer or physical storage media. The primary software resources include a selection of industry-leading Commercial Off-The-Shelf (COTS) packages.

Large Scale Displays

The need for large-scale visualization for data discovery and group presentation is placed on the broad shoulders of the passive stereo capabilities of the latest display the ASC MSRC has to offer - the VisBox™ from VisBox Inc. With a maximum resolution of 1400 x 1080 pixels (92" wide x 69" high), this large-scale display is made possible by two SXGA rear-screen projectors. These projectors are driven by a dual output Quatro FX 4400 PCI-Express graphics card hosted by a dedicated dual-processor (Intel Xenon) Linux workstation. The VisBox™ graphics system also has 16 GB of RAM and a 200 GB hard drive, which permits even the most complex data sets to be loaded.

Multiple Displays

The call for larger display areas is met with a dual processor (2.4 GHz Intel Xenon) Linux workstation with 16 GB of RAM and 256 MB of video RAM, driving two 24" flat-screen panoramic monitors. In addition, several of the bulky CRT monitors in the SciVis lab have been replaced with 21" LCD flat screen monitors from Viewsonic Corporation. The replacement displays preserve valuable desktop space while providing sharper and brighter images than the old CRT displays.

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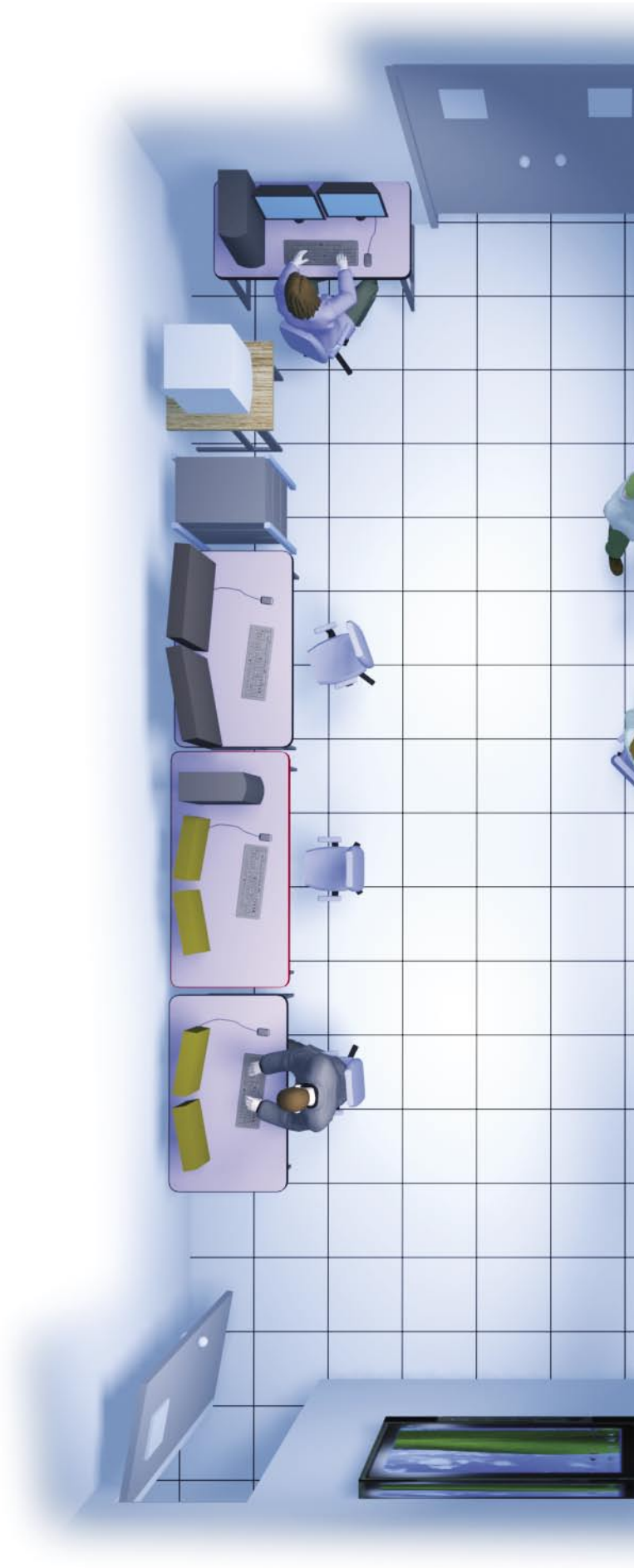


The SMART™ board system rounds out the new display capabilities of the SciVis lab. The SMART™ board system combines a 50" plasma display from NEC and an interactive touch screen overlay. The SMART™ board touch screen can interact with any application which would incorporate the same activity as clicking a mouse or selecting a menu. The system is ideally suited for PC presentations, hands-on tutorials or discussions, and interactive researcher/vendor led training.

Software

The software capability of the lab is also being extended by adding additional Ensight and CAVElib licenses, which will enable increased remote visualization and stereo development. In addition, a multi-media PC with dual displays supporting the full suite of Adobe Premier Movie creation software and the EON Virtual World Toolkit is now available. This PC will provide an environment for the professional development of finished user data for presentations and conceptual visualizations.

Visualization Support

Do you have a visualization data set and want to bring it to the lab? Or, do you want to take your visualization or movie that was created in the SciVis lab back to your office or conference? The SciVis lab has made both of these operations possible by providing CD/DVD authoring software/hardware on two Linux workstations directly connected to our network for the fastest data throughput.

- *Displays – Save Desktop Space (21" LCD Viewsonic Flat screens)*
- *Large Scale Display – VisBox™, Passive Stereo, Head Tracking*
- *Multiple-Display – 24" Panoramic & High-end Linux Workstation*
- *CD/DVD Authoring – Direct ASC MSRC Network access on multiple workstations (4.4 GB maximum single file size)*
- *Presentation – 50" Plasma Display - SMART™ board with touch screen*
- *Software – Adobe Multimedia, EON Virtual World Toolkit, Ensight & CAVE licenses*

You're Invited to Take a Test Flight

The SciVis lab wants to be the key that allows the researcher to unlock the visualizations that will fly well into the 21st century. The ASC MSRC invites you to visit the new SciVis lab for your "test flight" today.

Please contact the ASC MSRC Service Center at msrchelp@asc.hpc.mil, or (888) 677-2272 or (937) 255-1094.

A Useful LSF Command: bstat

By Dr. Xiaofeng (Frank) Duan

Often a user would like to attain information about the queue and job status before or after submitting Load Sharing Facility (LSF) batch jobs. On ASC MSRC's HPC systems, a handy command, *bstat*, is designed for such a purpose.

The *bstat* command is used to request the status of jobs, queues, or a batch server. Generally, the *bstat* command will provide the following information written to standard out:

- Job ID
- User Name
- Queue Name
- Job Name
- Session ID
- Required CPUs
- Required Memory
- Required Time
- Execution Status
- Wait Time
- Elapsed Wall-time

A summary of the requested CPUs versus the total number currently in use is also presented.

The synopsis to use *bstat* is as follows:

bstat [queue and job options] [user options] [other options]

The queue and job option is one of the following (default is -a):

-a	shows queued and running jobs
-i	shows queued jobs
-r	shows running jobs
-d	shows recently completed jobs
-A	same as -ad or –rid

The two selections for user options are:

-w	print job information for current user only
-u <user|all>	print job information of specified or all user(s)

There are twelve choices for other options. The most common ones are:

-s	shows status of both running and queued jobs (default)
-is	shows jobs in a queue and reasons that they are not running
-S	print summary of running and queued jobs sorted by user
-q	queue print information of jobs connected to specified queue
-h	print usage message

Use *bstat* to request the status of jobs, queues, or a batch server.

With the rich information provided by *bstat*, a user can make a decision about a job's LSF request before submitting it and monitor its status afterwards. For example, user johndoe submits a job to the regular queue on hpc11. He first uses the command:

bstat -q regular

to get the status of the regular queue and to decide how many processors and wall time to request. Later after submitting his job by using "*bstat* -u johndoe" he discovers the job is not running. He then issues the command:

bstat -u johndoe -is regular

to find the reasons why the job is still waiting in the queue.

For additional information on the *bstat* command or how to use it, a user can either use the "man *bstat*" or "*bstat* -h" command to get details.

For assistance using *bstat*, please contact the ASC MSRC Service Center at msrchelp@asc.hpc.mil, or (888) 677-2272 or (937) 255-1094.

Use of AutoTools Provides Users Expanded Resources

By Dr. Scott Kajihara

Users who run software that is distributed as source code know the difficulties that can be encountered when porting the code from one computing platform to the next. The ASC MSRC provides tools that developers can use to ease the burden on the users. With some additional labor, a developer using GNU Autotools can increase the number of supported platforms, as well as simplifying the build process for their codes.

The common method for distributing code is to create a *Makefile*, or a collection of *Makefile*'s, that defines the build of the package on the known, supported platforms. In some cases, these *Makefile*'s require GNU Make to interpret the constructs. In comparison, GNU Autotools creates *Makefile*'s that will work with *Make* on any Unix platform.

GNU Autotools consists of the utilities Autoconf, Automake, and Libtool, which are available from the Free Software Foundation (www.gnu.org). Only the developers require these tools; GNU Autotools creates scripts in Bourne sh and m4 macro preprocessor that are available on any Unix platform.

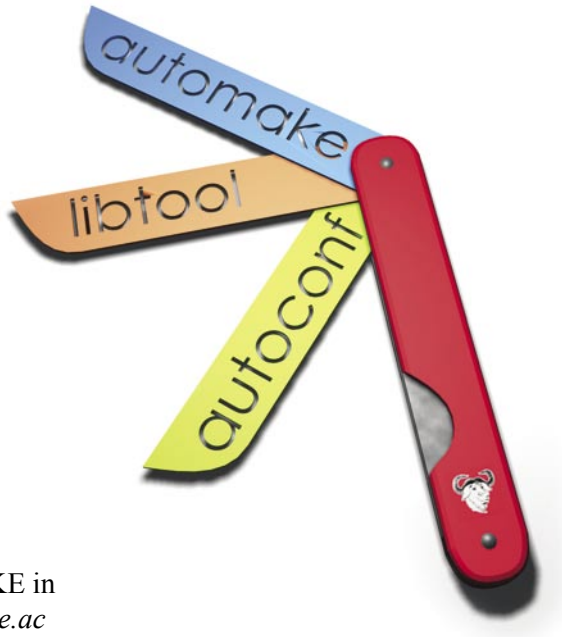
The *configure* script generates the final *Makefile*'s with template *Makefile.in* files. Automake generates the *Makefile.in* files from the *Makefile.am* files. A simple form of *Makefile.am* is:

```
lib_LIBRARIES = libfoo.a
libfoo_a_SOURCES = bar1.c bar2.f
```

which defines a library *libfoo.a* with source elements *bar1.c* and *bar2.f*. The final *Makefile* will contain rules for creating the library using default compile and link rules appropriate for the target system.

Autoconf produces the *configure* script from the file *configure.ac*. This *configure* script does not require any of the GNU Autotools. A corresponding *configure.ac* file for the aforementioned *Makefile.am* is:

```
AC_INIT(libfoo, 1.0)
AM_INIT_AUTOMAKE
AC_PROG_CC(cc cl egcs gcc)
AC_PROG_F77(f77 xlf fc g77)
AC_CONFIG_FILES(Makefile)
AC_OUTPUT
```



The required arguments of AC_INIT are the name and version of the package. Automake requires AM_INIT_AUTOMAKE in the *configure.ac* file. AC_PROG_CC and AC_PROG_F77 define the tests for the C and Fortran 77 compilers, respectively. In both cases, the optional search list of compiler names is present. AC_CONFIG_FILES defines the files to create (*i.e.*, *Makefile* from *Makefile.in*). AC_OUTPUT generates the file *config.status*, and runs *config.status* to create the files from the configuration.

To create the *configure* script, execute:

```
aclocal
autoconf
automake -- add-missing
```

An example of GNU Autotools is presented to simplify user-initiated configuration of a library. GNU Autotools provide various tests and operations to define the resulting *Makefile*'s. Depending on the amount of platform-specific parts in a code, the effort of porting to a different platform can be minimized by using GNU Autotools.

For more information, please refer to Gary V. Vaughan, *et al.*, *GNU Autoconf, Automake and Libtool*, Indianapolis: New Riders Publishing, 2001.

For assistance using GNU Autotools, please contact the ASC MSRC Service Center at msrchelp@asc.hpc.mil, or (888) 677-2272 or (937) 255-1094.

ASC MSRC Support for Challenge Projects

By Tracey Smith

The HPCMP provides many benefits to researchers that receive DoD Challenge project long-term grants of computational time on its HPC resources. Those benefits include large allocations of hours and a higher priority for their jobs in the HPC system queues than non-Challenge users, which ensures that valuable DoD assets are appropriately dedicated to our highest priority and most demanding projects.

The ASC MSRC strives to provide additional benefits to Challenge users who receive allocations on the systems at the ASC MSRC. Some of these additional benefits include:

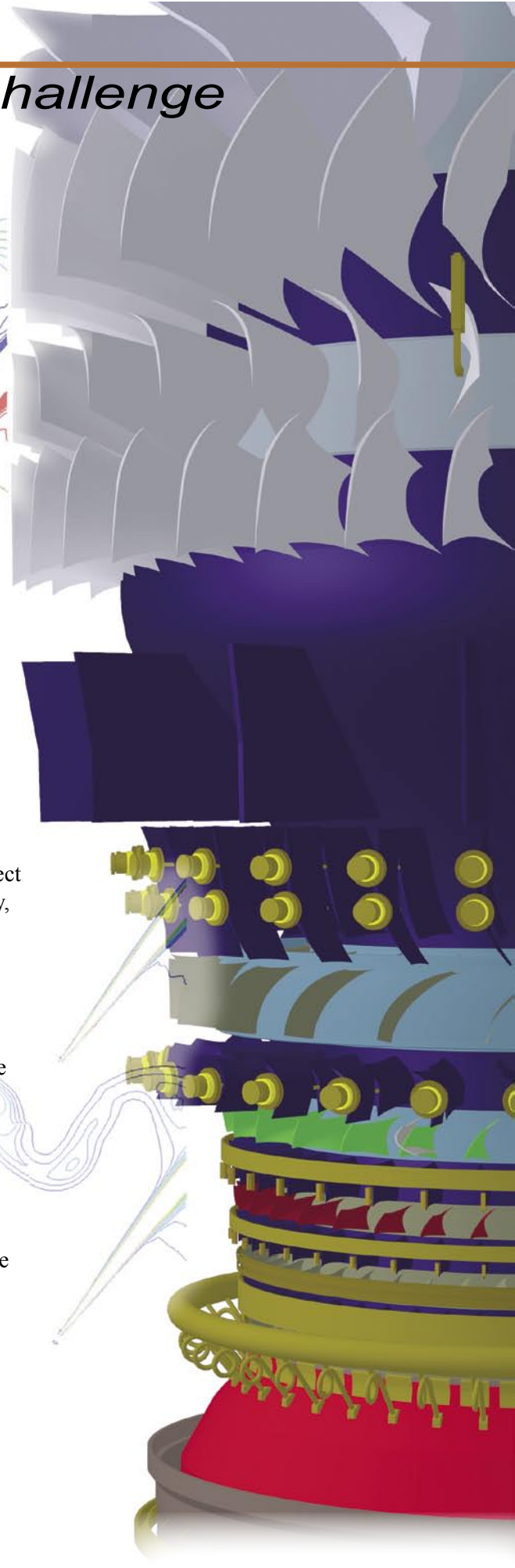
- ASC assigns two Challenge coordinators to oversee all Challenge projects at the site. The coordinators track the usage of the Challenge projects and act as the advocates at the center for any Challenge users' issues. The Challenge coordinators report back to ASC MSRC management monthly on the progress of the Challenge projects.

- Each project is assigned a technical point of contact (POC) on the ASC MSRC staff. The POC maintains contact with the Challenge project principle investigator (PI) to ensure that their project stays on track. If a Challenge project encounters a technical difficulty, it becomes the top priority of the POC to solve the problem. The POCs meet regularly with the Challenge coordinators to discuss the progress and any problems that the individual Challenge projects are experiencing.

- Also, the ASC MSRC offers the use of its Outreach staff to provide support to the Challenge projects in generating their reports and presentations. This staff includes technical writers and editors who assist in creating professional looking documents and graphics, and video production facilities and staff who assist with visual presentations.

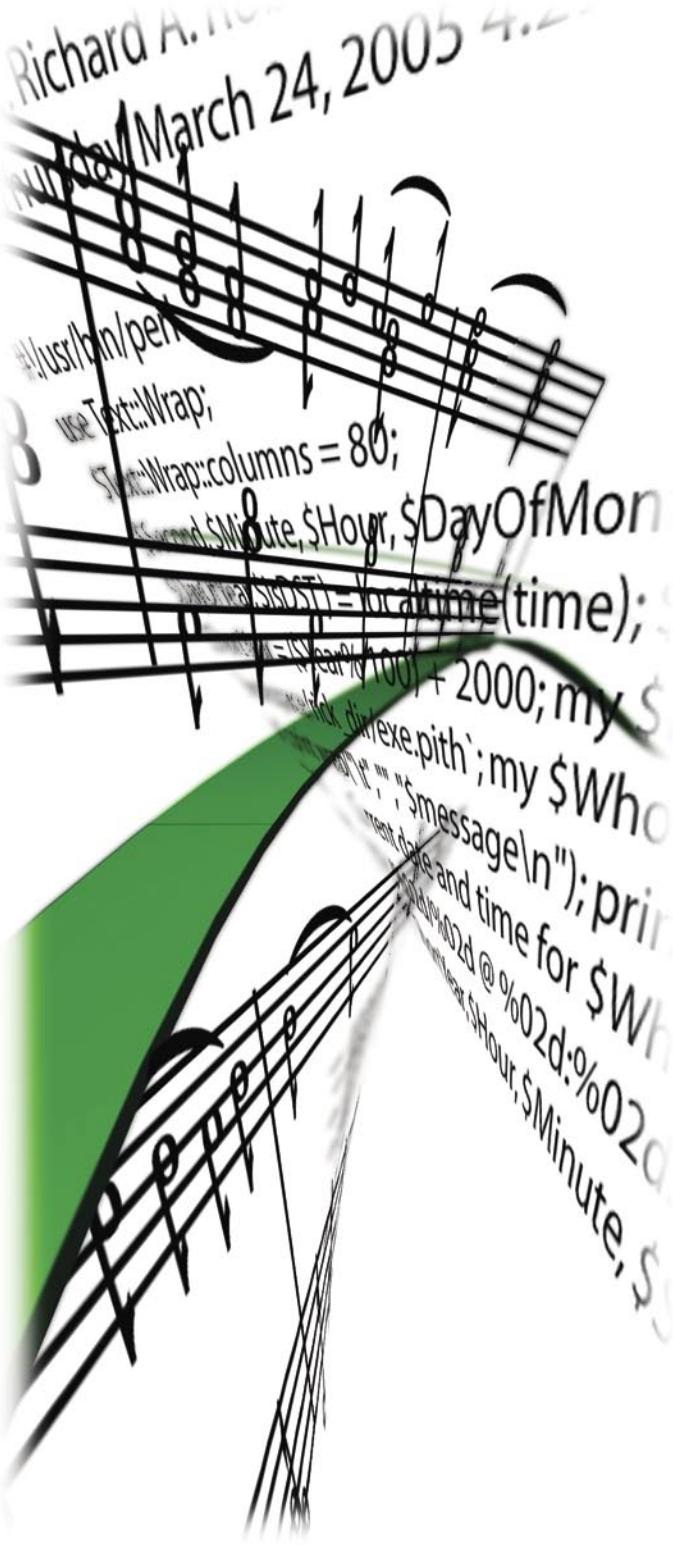
The ASC MSRC's philosophy is to provide each Challenge project with the level of personalized service that the project PI desires. This personalized treatment ensures that the Challenge PIs have no obstacles in completing their projects.

Contact the ASC MSRC Service Center at msrchelp@asc.hpc.mil, or (888) 677-2272 or (937) 255-1094 for additional information.



High Priority Challenge Users Sing Duet de Client, Opus Pingouin

By Rick Roberts



The symphony we wrote to assist users in the successful completion of their high priority projects comes in two-part harmony: 1) The approach we have discovered that works best for us to help you, and 2) What you can do to make it easier for us to assist you.

But in some ways, ASC MSRC customer service is similar to a jazz symphony, for while the underlying chords remain the same from performance to performance, each person adds their own improvisations to it. The personal notes used in the bridges and riffs may not be well suited for another. All that can be done is to play the notes as the individual hears them.

And in truth, this symphony's chords are applicable to all phases of running at the ASC MSRC, but the special circumstances surrounding both Challenge projects and the officially designated high-priority projects amplify any dissonance to a cacophony.

What can you do to make it easier for us to assist you?

Understand how to run at the ASC MSRC
Issues of the batch scheduler are usually not too difficult for users to sort out, but practices such as not running out of $ARC or $HOME, and how to use $WORK_DIR are important. Nothing is more frustrating than to sit in a queue, only to have a job die because your $HOME filled up or because the scrubber deleted some files.

Understand what your program does
This does not mean program functions at the macro level. What is meant is what the algorithms are and where these are located within the code. If a bug develops, it makes it much easier to assist you in debugging if we have an idea where, within the several tons of source code, to begin our search.

Contact us with problems you anticipate
Do you have large files that need to be copied from $ARC? If so, then let us know. We should be able to determine a way to get them prestaged to avoid the scrubber. If we know about your needs and potential hang-ups ahead of time, we can usually develop a solution.

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Communicate, communicate, communicate!
If we are monitoring your job and have a question, how would you like to be contacted? What hours are you available for us to contact you? How critical is after-hours contact for processing your jobs? Communication is a two-way street; therefore, by having your contact information in advance, we can help to keep you informed about your job.

Contact us when you submit jobs
You would need to email or call us with your job numbers in order for us to be aware and monitor your job submittal.

Know your scripts
While this may sound patently obvious, you may be surprised at the types of service ticket requests that are received, such as, "My script is broken, and ever since my grad student, who wrote it, went to a 'Nine Inch Nails' concert, his eyes won't focus. I need it done in an hour. Thanks!" When working to resolve the issue, an examination of the script shows six pages of perl, c-shell, and Korn shell, with the sole comment, "The following lines are incorrect."

Knowledge even unto the excruciating minutiae of your scripts is essential, and under no circumstances should grad students be allowed out of your sight! After all, coding your jobs to run properly may take the conductor, not the inexperienced novice.

How can we help you?
The more we know about the details of your program's needs and your requirements, the better job we can do. For example, if job 2 depends on the output of job 1, and job 1 dies, then we can suspend job 2 until we get job 1 fixed. If we know your jobs' numbers, we will try to accommodate your job. If we are aware of the files that a job requires, as well as the location of all scripts and programs, we may be able to requeue a job that dies from a system crash.

Summary
Communication is a two-way street. Just as we need to be able to get in touch with you, you need fast access to us. And at this point, it starts to get a bit sensitive. My individual improvisations include my willingness to find creative arrangements for harmonious communications. Through continually monitoring email for job status, even during off-hours, accessibility to our expert assistance can be readily available for the discriminate user. With an ongoing, interactive two-way communication process between the user and systems administrator, customer service for high priority users remains paramount at ASC MSRC.

The key to success.... communicate, communicate, communicate!

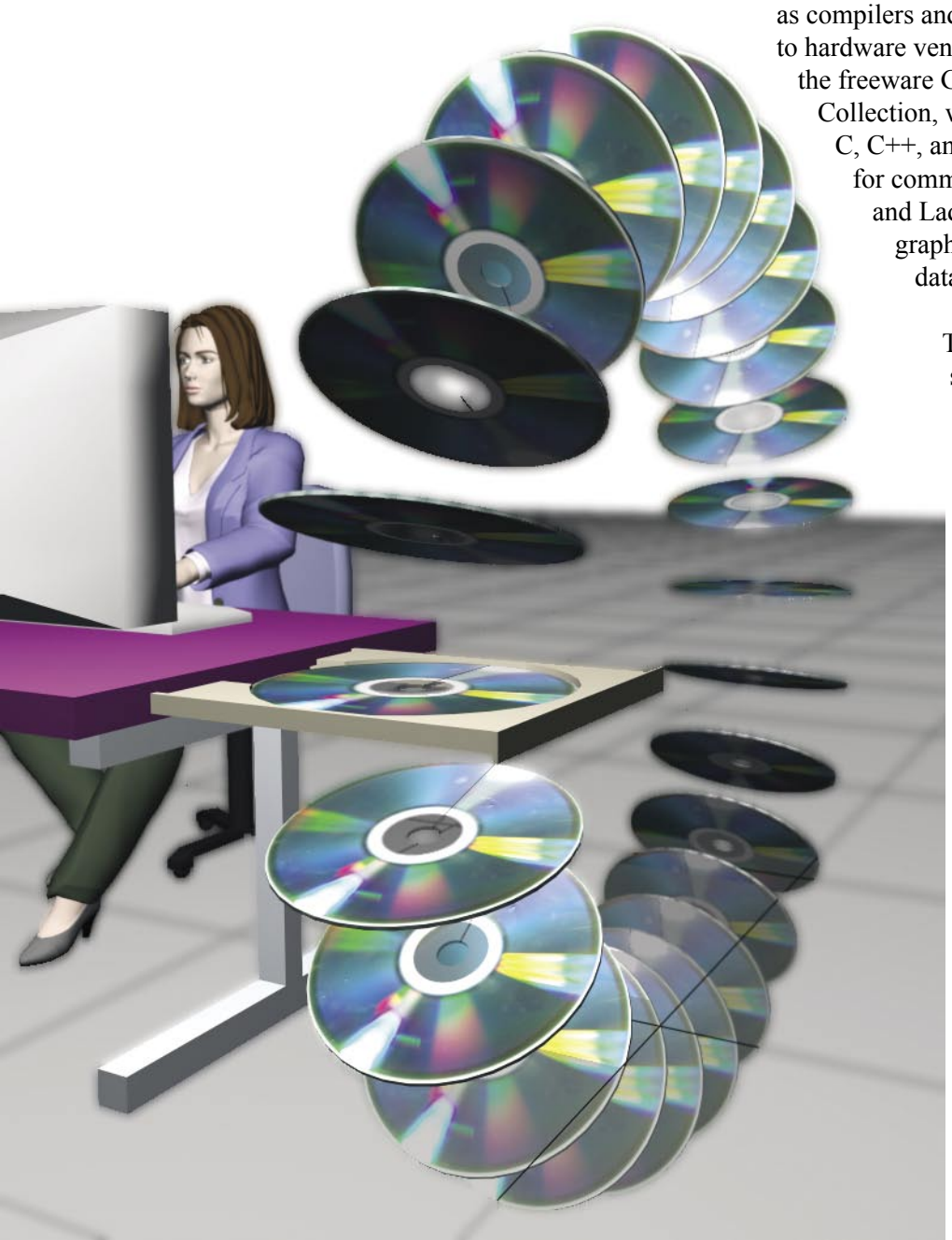
While some of these projects are highly complex, some are relatively simple. Some have the harmonic leaps of Chopin's "Military Polonaise," and some the elegant simplicity of Brubeck's "Kathy's Waltz." Sometimes, the tempo and rhythms change and shift, but we've yet to be dissatisfied with the concert. After all, at ASC MSRC, we are playing your opus.

If there are any questions or comments, please contact the ASC MSRC Service Center at msrchelp@asc.hpc.mil, or (888) 677-2272 or (937) 255-1094.

Software Offerings Add to the Game at the ASC MSRC

By Casey Bretti

In addition to access to HPC platforms, such as the SGI Origin 3900, the typical HPC user requires software as well. For some users, this is in the form of Commercial or Government Off-The-Shelf (COTS or GOTS) software which may be difficult for the HPC user to acquire. Even when the HPC user writes their own application, they still need compilers, debuggers, and visualization tools. The ASC MSRC offers an impressive list of COTS, GOTS, and Open Source/Freeware packages for the HPC user.



ABAQUS, a code used by Computational Structural Mechanics (CSM) researchers to calculate solutions for linear, non-linear, explicit, and multi-body dynamics problems, is an example of a COTS application. The ASC MSRC not only provides access to this software, but also provides technical support to users of the application.

AVUS is a GOTS application that solves the Navier-Stokes equations for fluid-flow around structures. Researchers in the Computational Fluid Dynamics (CFD) area will find this application valuable.

For users who develop their own applications, tools such as compilers and debuggers are necessary. In addition to hardware vendor tools, the ASC MSRC provides the freeware GCC tools. GCC is the GNU Compiler Collection, which consists of compilers and libraries for C, C++, and Fortran77. DDD is a graphical front-end for command line debuggers, such as GDB, DBX, and Ladebug, and is well known for its interactive graphic data display that uses graphs to illustrate data structures.

The ASC MSRC has one of the largest software baselines among the HPCMP centers. This large software baseline is supported by a highly qualified staff of technicians who are ready to provide technical support for the applications. In addition, the ASC MSRC adds to that software baseline, based on user requests within the constraints of funding, security concerns, and technical support. Our focus is on making sure that users have everything that they need to stay in the game.

For additional information regarding the ASC MSRC software baseline, you may access www.asc.hpc.mil/consolidated/softwareASC_ALL.php, or contact the ASC MSRC Service Center at msrchelp@asc.hpc.mil, or (888) 677-2272 or (937) 255-1094.

The History of Disaster Recovery at the ASC MSRC

By Tracey Wilson

Protecting User Data

Today's world is often an uncertain one when it comes to preserving important assets. Accidents and natural disasters, such as fires, flood, earthquakes, and hurricanes forces us all to consider insurance policies to help provide coverage for the things we value most. On September 11, 2001, the horrible attacks on the World Trade Center (WTC) buildings and the Pentagon opened the eyes of the world to the threat of terrorism. The strikes were made to damage the commercial, financial, and military infrastructure of this country. Several companies lost all their relevant business data in the attacks and were unable to recover. Many of the companies involved at the WTC had copies of their financial and primary business information stored at the other tower, but all their vital information was lost when both towers were destroyed. Of the fortunate few companies that managed to survive after the attack, many were forced to recreate their data from scratch or from some limited off-site storage.

A true disaster recovery setup and procedure could have saved many of these companies. After the attack, the US Government recognized that organized disaster recovery plans should be a part of all its organizations. In 2002, the DoD provided requirements in its new regulations 8500.1 and 8500.2 requiring DoD organizations to provide disaster recovery plans and operations.

In the spring of 2002, the ASC MSRC began to evaluate the elements of a true disaster recovery plan to protect all user and system data stored at the center. The evaluation concluded that the essential elements included:

1) Disaster recovery site should not be located within the same geographical area,
2) the data should be designated as a third copy,
3) the method of preserving the data should take advantage of current storage technologies, utilize Defense Research and Engineering Network (DREN) connections, and utilize encryption over the wide area, and
4) a defined process is necessary to provide users access to their data in a short amount of time in the event of a disaster.

During the summer of 2002, ASC worked with the San Diego (SSC-SD) to create a remote archiving disaster recovery solution. This solution provided ASC with a disaster recovery solution that answered all listed criteria and leveraged existing archiving technology to a new level. The current archiving software, SAM-FS, provided by Sun Microsystems, was tested for remote archiving in local or metro environments. This solution was the first of its kind for a wide-area connection.

In December 2002, the disaster recovery connection from ASC to SSC-SD went operational, and user and system data started flowing to a new third copy. The remote archiving solution provided valuable experience for ASC and Sun, and proved to be a real proving ground to mature the technology. Before the connection was changed to the HPCMP disaster recovery site, a total of 125 Terabytes of data had been synchronized with the remote site.

HPCMP establishes program-wide

Disaster Recovery Site

to protect important program data.

In early 2003, the HPCMP began an investigation into creating a program-wide disaster recovery solution. A team composed of representatives from all four MSRCs, two of the allocated Distributed Centers (DCs), and the HPCMP was created. This group, called the Disaster Recovery Advisory Team (DRAT), was tasked to develop a solution in which all program sites could participate. The primary focus of this initiative was to protect the important program data. Many of the initiative goals aligned with the ones that had been identified by ASC in its disaster recovery project. Several issues were addressed that dealt with archiving, encryption, user access to data after a disaster, configuration management, data management, testing, and training.

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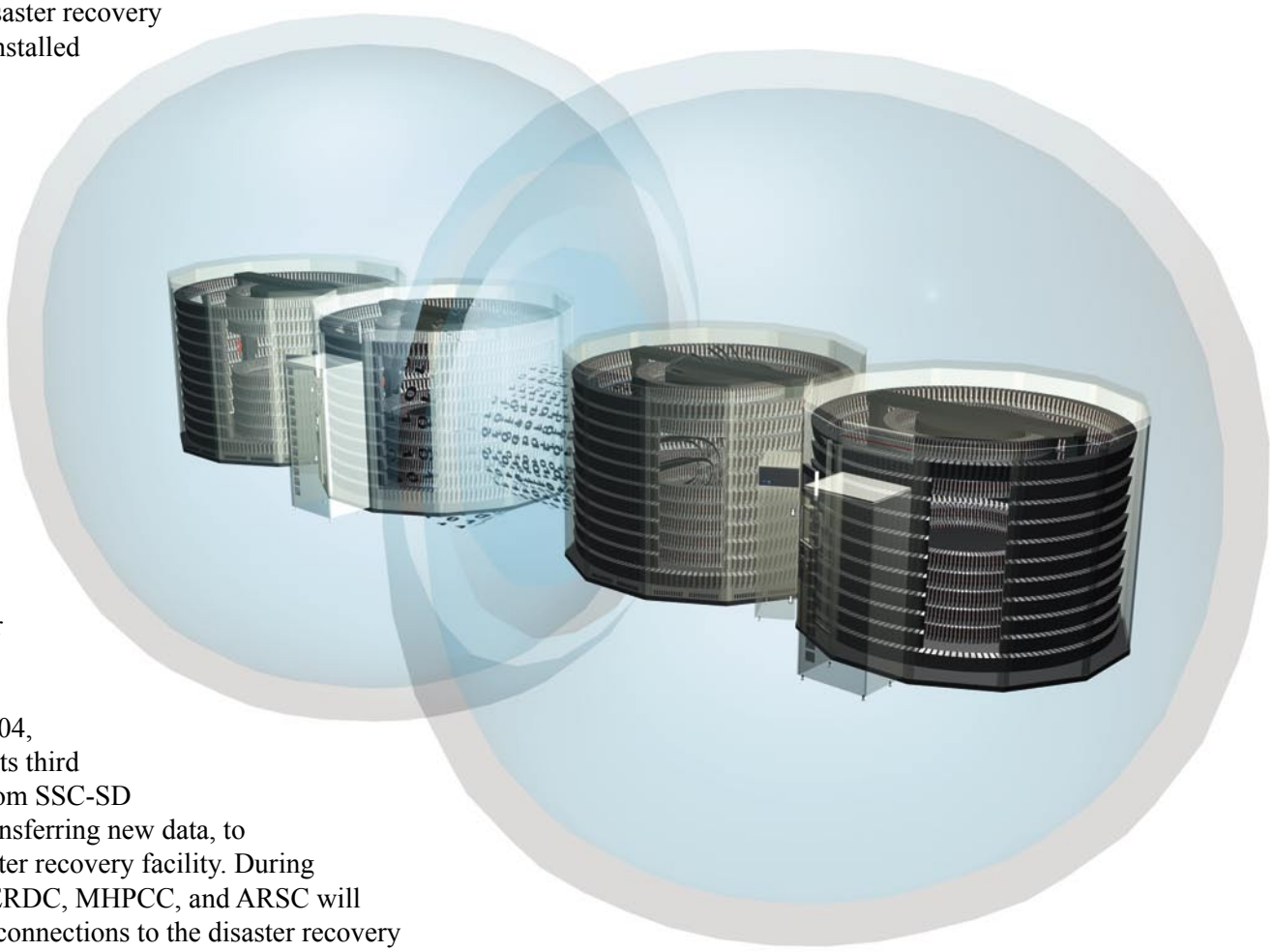
After several months of planning, a disaster recovery plan was developed to send the program data to a designated disaster recovery facility. This plan, based on the ASC model of remote archiving, uses the same technology for archiving, uses DREN for connections, and encrypts all data over the wide area. In the event of a disaster at a specific site, a detailed process was developed that allows users to access their data within five days.

In September 2004, all equipment at the new disaster recovery facility was installed and ready for testing. ASC participated in testing connections and data transfers to the new facility and assisted in testing at other sites. NAVO was the first MSRC to transfer data to the disaster recovery facility. In December 2004, ASC moved its third copy tapes from SSC-SD and began transferring new data, to the new disaster recovery facility. During 2005, ARL, ERDC, MHPCC, and ARSC will finalize their connections to the disaster recovery facility and begin transfers.



Every effort continues to be made to provide the best ways for users to access their data in the event of a disaster through using a solution to properly house, store, and protect that data. Disaster recovery is a priority for many organizations. The progression of remote archiving from the ASC to SSC-SD solution, to the larger HPCMP wide project, is a major step forward in protecting the user's most important asset - their data.

For more information, please contact the ASC MSRC Service Center at msrchelp@asc.hpc.mil, or (888) 677-2272 or (937) 255-1094.

Ship Airwake Flow Study Enhances Pilot Training and Mission Safety

By Gary Sivak and Dinah Luneke

This high priority project, "Integrated Ship/Rotorcraft Airwake Simulation" was run at ASC MSRC in FY04 by Principal Investigator Ms. Susan Polsky of the Naval Air Weapons Center, in Patuxent River, Maryland.

Perhaps the most demanding of all aviation environments, the operation of aircraft from ship platforms involves turbulent airwake produced by a ship's superstructure. This phenomenon is a major contribution to the workload required for such operations. Past airwake modeling efforts were, at best rudimentary, offering only representative levels of turbulence for a particular ship class. The current study involves the prediction of time variance for ship dynamics variables.

Ship Airwake and Flight Simulations

"The emphasis of our work at the ASC MSRC is to understand the physics of ship airwake flows and to predict those flows with sufficient accuracy to aid in ship design, aircraft control system development, and pilot training," Ms. Polsky stated. "Airwake data produced by Computational Fluid Dynamics (CFD) computations has been integrated with real-time, pilot-in-the-loop flight simulations and autopiloted simulations." (Figure 1)

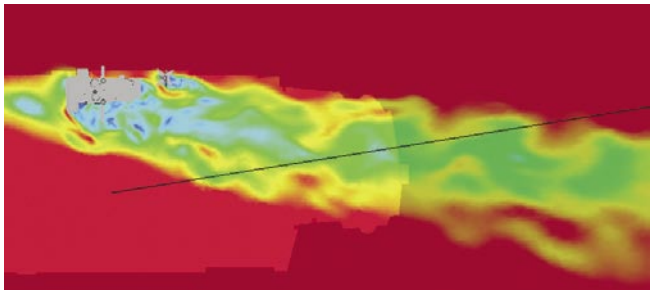


Figure 1. CFD solution overhead view, color-coded to show areas of high airwake produced by the island structure and a typical fixed wing flight path.

This research project seeks to understand the physics behind the complex, and difficult to model, interactions (hydrodynamics coupled with aerodynamics) between naval ships, the ocean, the air above and behind, and Naval aircraft flying through airwakes. Turbulent airwakes created behind a ship, such as when a large aircraft carrier plows through the water, are especially evident within the vicinity of an island. An airplane flying behind a ship can experience a sudden and unexpected drop in indicated airspeed, similar to what a moving car experiences while "drafting" behind a tractor trailer. Produced mainly by the ship's superstructure, the airwake starts out on the scale the same size of the ship, from a length of a few thousand feet, and may extend up to approximately a mile in length.

CFD Modeling

By applying CFD to understand the underlying physics, Ms. Polsky describes the impediments to modeling as "turbulent, unsteady, chaotic, and difficult to model." The researchers have tried to manage the scope of the effort, by only modeling the laminar (boundary layer near surface) flow, and not the turbulent (distant free wake) flow. The researchers have a high confidence level that the Cobalt application running on the ASC MSRC SGI O3900 "gets them close to reality." (Figure 2)

Research Applications

Through this invaluable research, Ms. Polsky seeks to use the output of this analysis to improve ship design, aircraft control system development, and by entering the data as inputs for flight simulators, to improve pilot training. In the past, the flight simulators would shake the pilots with a certain frequency profile, i.e., they would experience the same identical "random" turbulence pattern over and over again. With the inputs of this new research, Ms. Polsky is endeavoring to incorporate the cyclically, varying turbulence patterns into flight simulator training sessions to impart a more realistic flight experience for the pilots,

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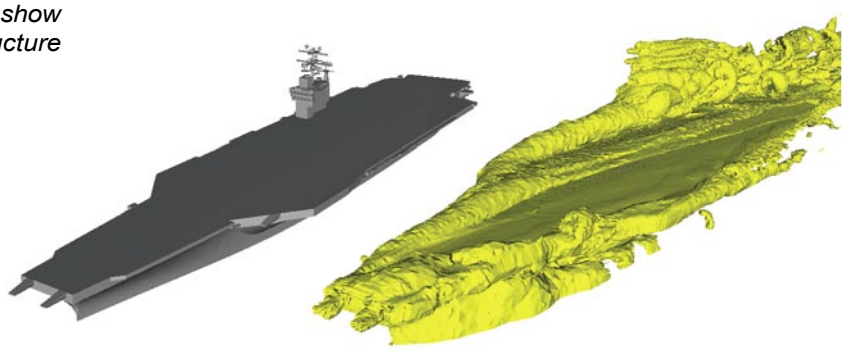

Figure 2. The CFD model of the CVN 73 aircraft carrier (left); the same carrier rendered in yellow (right) represents the airwake prediction using iso-surfaces of vorticity.

better educating them to handle these chaotic, and potentially life threatening aerodynamic conditions. (Figure 3)

Improving mission readiness and saving lives while protecting valuable resources continues to inspire Ms. Polsky in the development of "better ships, better aircraft, better control, and an increase in operational capability."

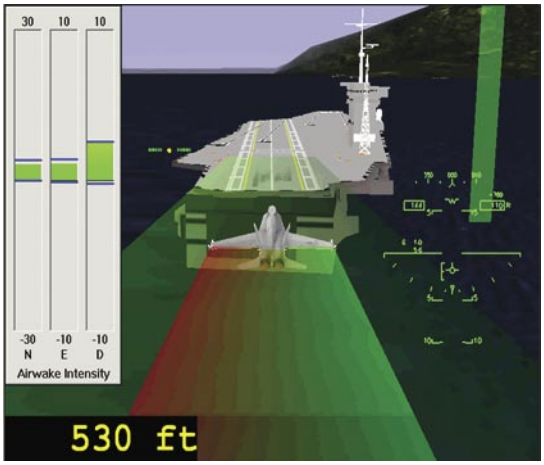

Figure 3. Display produced by off-line flight simulation tool developed to evaluate impact of ship airwake on aircraft operations.

For information regarding this research please contact Ms. Polsky at susan.polsky@navy.mil or contact the ASC MSRC Service Center at msrchelp@asc.hpc.mil, or (888) 677-2272 or (937) 255-1094.

News

Computational Science & Engineering Workshop Explores HPC Usage

By Drs. K. Hill, J. Benek, R. Pachter - Steering Committee

An Air Force-wide Computational Science & Engineering (CSE) workshop, applying HPC, was held January 24-26, 2005, in the Materials & Manufacturing Directorate, Air Force Research Laboratory (AFRL), Wright-Patterson AFB. The purpose of the workshop was to review computational science and technology, and test and evaluation, for a broad range of AF applications and to define the first step towards developing a new coherent vision for integrated interdisciplinary CSE/HPC, as a transformational tool to meet future AFRL technology challenges, which will enable the AF to achieve new key capabilities, otherwise not possible.

The workshop was opened by Dr. Tom Cruse, Chief Technologist, AFRL, who posed the objective of achieving a vision for "CSE as a transformational technology to meet future Air Force challenges." Dr. Cliff Rhoades, Director, Mathematics and Space Sciences, AFOSR, and Dr. Ed Kraft, Technical Advisor, AEDC, presented accounts on the significant potential in addressing AF problems by theory and computation. Achieving future HPC computational requirements was addressed by Dr. Robert Peterkin, SAIC, in his talk on "*Towards Petascale Computing for Defense R&D: How Close are We and What Do We Still Need to Do?*" Cray Henry, Director, HPCMPO, introduced the program's capabilities and future plans, and Dr. Leslie Perkins, HPCMPO, discussed Programming Environment and Training (PET). Steve Wourms, ASC MSRC Director, described the center as a HPC partner, and Mike McCraney, MHPCC, gave a view on the future of HPC.

The two-day technical program of the workshop focused on computational applications ranging from structural mechanics, to fluid dynamics, electromagnetics, and chemistry and materials science. Dr. Ravi Chandra, VA, described simulations in structural sciences, followed by presentations by Dr. Dean Foster, ML, on a virtual design platform for composites, and Dr. Scott Fawaz, AFA, on support of the AF structural integrity program. Ground target penetration mechanics were outlined by Dr. Joseph Keen, MN. Computational fluid dynamics examples were summarized by Dr. Reid Melville, VA, while Dr. Steve Gorrell, PR, described the development of future AF CONOPS propulsion systems by CSE. Dr. Balu Sekar, PR, summarized IHPTET/VAATE combustor analysis using HPC, and Dr. Scott Morton, AFA, discussed advances in CFD of full aircraft. Dr. Peter Lamm, PR, presented a talk on distributed heterogeneous simulation for interdisciplinary design. Dr. Tim Madden, DE, outlined aspects of high power gas lasers modeling, while Dr.

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Left to right, Dr. Steve Gorrell (AFRL/PR) and Mr. Steve Wourms (ASC MSRC).

Left to right, Dr. Jean Luc Cambier (left rear) (ASFRL/PR), Maj Kevin Benedict (MHPCC), and Maj Amy Magus (AFRL/AFOSR).

Left to right, AFRL Chief Technologist Dr. Tom Cruse and Dr. Kueichien Hill (AFRL/SN).

Left to right, Dr. James Myatt (AFRL/VA) and Capt Lauri Lyons (AFRL/HE).

Left to right, Dr. Dennis Dimiduk (AFRL/ML), Dr. Chris Woodward (AFRL/ML), Dr. Ruth Pachter (AFRI/MRL), and Mr. Jeff Graham (ASC MSRC).

Jean Luc Cambier, PR, discussed high energy density plasma. Dr. David Moorhouse, VA, described system integration aspects, and Dr. James Myatt, VA, summarized recent M&S for control of micro unmanned air vehicles in complex wind fields. M&S and HPC in technology assessment were discussed by Dr. Dave Brown, VA. A number of computational chemistry, biology, and materials science challenging HPC applications were presented, including modeling of molecular, nano/biomaterials, by Dr. Ruth Pachter, ML; biotechnology, by Dr. John Frazier, HE; fuel, by Dr. Don Phelps, PR; and the accelerated insertion of metal alloys, by Drs. Dennis Dimiduk and David Johnson, ML. Automatic target recognition and sensor fusion applications were summarized by Dr. Kueichien Hill, SN, and Dr. Andy Greenwood, DE, presented aspects of virtual prototyping of high power microwave systems. Directed energy bioeffects were discussed by Capt Lauri Lyons, HE. Optical turbulence prediction in support of ABL, was presented by Dr. Adrian Wheelock, VS. Drs. Richard Linderman and Duane Gilmour, IF, outlined requirements for interactive HPC, supporting C4ISR and real time decisions. Performance and learning in cognitive modeling was presented by Dr. Jerry Ball, HE.

Overviews of the recently awarded HPC software applications institutes by Col Christopher Cook, SEEK EAGLE Office, on air armament, and by Maj Kevin Benedict, MHPCC, on space situation awareness emphasized the challenging problems encountered.

A lively poster session ended the workshop with AFRL Research Council participation.

The first Air Force-wide CSE/HPC workshop was well received, highlighting the breakthrough technologies that can be addressed by theory and computation, and the significant ever-evolving HPC capabilities, thus providing a starting point for future synergistic, interdisciplinary, integrated CSE/HPC across the AF, to solve critical emerging problems.

Presentations are available electronically upon request. To request a copy or for more information contact Dr. Ruth Pachter at Ruth.Pachter@wpafb.af.mil.

Facilities Upgrade

By Steve Wilson

The ASC MSRC is currently performing an ambitious facilities upgrade through funding from the HPCMPO. The upgrade is absolutely essential for the ASC MSRC to keep pace with escalating facilities requirements over the next several years. In addition, the upgrade will, for the first time, allow the ASC MSRC to remain fully operational during required semi-annual air conditioning maintenance.

The upgrade will provide huge gains in space, power, and cooling capacities. Specifically, we've increased our available raised floor space on our main computer room floor by nearly one third. By taking administrative spaces off the Uninterrupted Power Supply (UPS), we've reduced our power draw on available power to the computers by nearly one fourth. The most dramatic gains will be in cooling capacity – going from an ability to support a maximum 290 ton requirement to the ability to support a 590 ton requirement as we add additional Air Handling Units (AHUs). The ASC MSRC has and, with this upgrade, will continue to provide services that are at the forefront of HPC.

Data Intensive Computing Environment (DICE)

By Lloyd Slonaker

Finding Tomorrow's Solutions - Today

The production and manipulation of large quantities of data are hallmarks of scientific research in the 21st century and are intrinsic features of major HPC applications. Computational scientists and researchers possess a seemingly infinite capacity to generate data, while an incredible amount of time is spent accessing, organizing, converting, and transferring this data. As it becomes increasingly common for the same data repositories to be used by different researchers located at various facilities, so does the ease of access and distribution of this data become critical. The ASC MSRC is embarking on a research project called the Data Intensive Computing Environment (DICE) to examine possible solutions to the onslaught of data produced. ASC MSRC has taken the lead for the DoD in establishing a consortium of government agencies, including the Department of Energy (DOE) and NASA, which utilize HPC and are all addressing similar data management issues.

The DICE project will address the problems associated with the creation and use of large quantities of data. Areas supported include the identification, investigation, and development of hardware and software solutions. The initial projects supported by DICE will evaluate current and emerging data access technologies and their ability to improve data accessibility over geographically distributed sites. This effort will evaluate "distributed file systems" solutions and identify ways to achieve and evaluate cross platform and global data sharing capabilities. In order to accurately test emerging technologies, the DICE project will use HPC facilities located at ASC, a DOE facility operated by the Ohio Supercomputer Center (OSC) in Springfield, Ohio and NASA Goddard in Greenbelt, Maryland. The creation of this interagency partnership provides a collaborative environment for active participation in technology evaluation and research activities. This partnership will maximize investment dollars while minimizing gaps and duplication of research efforts, and is in the spirit of the High-End Computing Revitalization Task Force (HECRTF) report.

The DICE environment will consist of a self-contained environment composed of compute, networking, and storage technologies, which is representative of what is found in production HPC centers. The initial DICE configuration will connect these self-contained environments at the ASC MSRC, OSC in Springfield, and NASA Goddard via high-speed dedicated networks. These networks are the DoD's Defense Research and Engineering Network (DREN), OSC's Third Frontier Network (TFN), and the NASA Research and Education Network (NREN). Once this initial DICE configuration is established, other agency members can participate in the emerging technology research.

The initial activities to be investigated at the three collaborating DICE sites include selected emerging hardware/software data accessibility solutions, and their usability in real-world problems. Because the environment connects to non-DoD systems, only publicly releasable data will be used. This data will be representative of current research activities occurring at the different agencies. Emerging technologies from both hardware and software vendors will be tested in this environment to provide the vendors and the agencies with insight into future requirements and solutions. Given the massive amounts of data produced in the course of government operations today, DICE will impact data management in future operational and scientific production of HPC environments - benefiting tomorrow's scientific research community.

For additional information, please contact the ASC MSRC Service Center at msrchelp@asc.hpc.mil, or (888) 677-2272 or (937) 255-1094.

Putting the User First at the ASC MSRC

By Dinah Luneke

As the saying goes, "The only constant thing in life is change." The ASC MSRC continues to develop and implement innovative ideas, new improvements, and exciting enhancements - all to benefit our users, our number one priority. By listening to the voice of the customer through surveys, feedback forms, website inputs, and one-on-one interchanges, the ASC MSRC seeks creative changes to enhance the users' experience.

At the annual DoD Users Group Conference (UGC) 2005, held in Nashville, Tennessee, the ASC MSRC "User First" theme touted the many updates and improvements being developed at the ASC MSRC to help improve the users' experiences.

At the ASC MSRC Birds of the Feather (BOF) session, held on Monday, June 27 at UGC, an exciting session planned for the users included a voice-of-the-customer update, a feedback form for users to provide valuable inputs, a question-and-answer session, and an exciting presentation about the recent ASC MSRC TI-05 installation.

For up-to-date user information, visit our website at www.asc.hpc.mil.

One of the major changes underway at the ASC MSRC is the development efforts by the Web Committee. A complete redesign of both the public and private websites is being developed, with new enhancements to the web being released in the near future.

ASC MSRC Web Committee Chairperson Charlotte Coleman stated, "We're excited about the website's new look and feel, improved navigation, and comprehensive - yet unique look - with the public site scheduled to be revealed to our users first."

One of the innovative features being considered for the private website is a "Message Board." This will allow users to post questions that can be viewed and responded to by other users. Responses from the ASC MSRC Service Center will also be posted and viewable by all users.

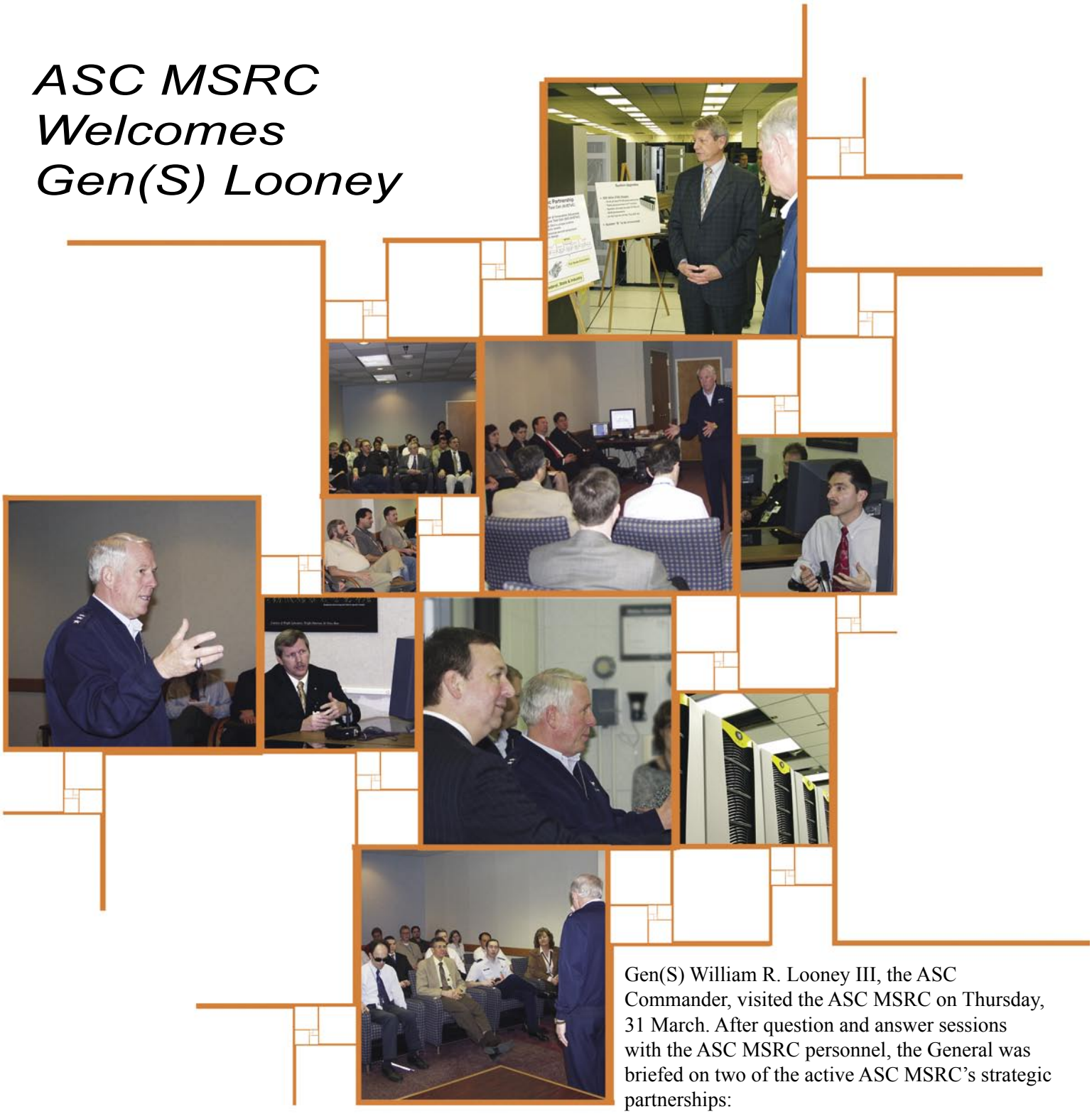
Since resolving service tickets is extremely important at the ASC MSRC, a "Customer Service Feedback Form" has been developed that is sent to each user as part of the service ticket resolution notification.

Customer Assistance and Technology Center Manager Dan Schornak explained, "We developed this feedback form to capture users' impressions at the time of service ticket resolution. This invaluable feedback will enable us to provide an even higher level of customer service."

Other positive changes for users include such features as a "Subscription Service" that is slated to go online this year. This subscription service will provide system status notifications to users, and will allow the users to choose if they wish to receive a copy of the most recent *Wright Cycles* mailed to them, either as a printed copy or a CD. Users will continue to have the option of accessing and printing a PDF version of the *Wright Cycles* from the ASC MSRC website (www.asc.hpc.mil/aboutus/journals.php).

These latest improvements will ensure the ASC MSRC meets our goal of keeping the "User First." For more information, contact the ASC MSRC Service Center at (888) 677-2272 or (937) 255-1094 or send an email to asc.hp.outreach@wpafb.af.mil.

ASC MSRC Welcomes Gen(S) Looney



Gen(S) William R. Looney III, the ASC Commander, visited the ASC MSRC on Thursday, 31 March. After question and answer sessions with the ASC MSRC personnel, the General was briefed on two of the active ASC MSRC's strategic partnerships:

- The Advanced Virtual Engine Test Cell (AVETeC), a partnership with industry, academia, and other Government agencies.
- The Data Intensive Computing Environment (DICE) a partnership with DOE and NASA established with Congressional plus-up funding.

Gen(S) Looney was also shown the first of our two TI-05 systems, the SGI 2048 processor Altix, which was named the "Eagle," after the F-15 fighter plane.

Hails and Farewells

The ASC MSRC welcomes those who have recently filled staff positions.

Joan Henley, ASC/HPTS

Josh Dotson, CSC, Operations

Ed Williams, OSC

Rebecca Busch, CSC, Computational Technology Center

Adrienne Rexroad, ASC/HP

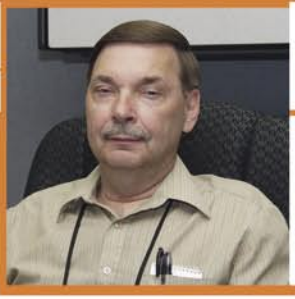
John Gebhardt, CSC, Advanced Technologies

Lloyd Slonaker, ASC/HPTT

Jim Greene, CSC, Systems Admin

Steve Eldridge, Abacus

Brent Siglar, CSC, transferred to the Service Desk



Dave Kracirik, The Greentree Group, Consultant

Chanon Owen, CSC, transferred to the Systems Admin group

Several key personnel have left the ASC MSRC recently. They will be missed.

Cindy Brodess, WITS

Orville Walters, CSC, Senior Database Analyst

Amy Adolph, Multimax

Millie Pitman, The Greentree Group, Consultant

ASC MSRC and PET Working Together to Support Customers

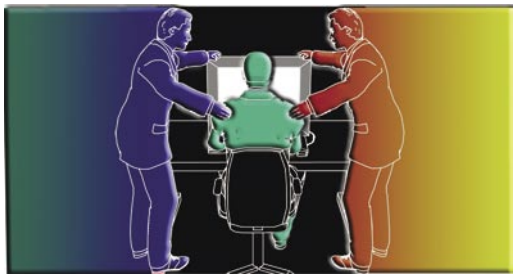
By Brian Schafer

As part of the Programming Environment and Training (PET) team, I get the chance to talk with a number of DoD HPC users about the PET program. Invariably, someone will say "I didn't know Dr. So-and-So was part of the PET program. I thought he/she was part of the MSRC." Do you ever wonder how the PET program works with the ASC MSRC to support our customers?

As components of the DoD HPCMP, PET and the ASC MSRC work together to achieve the vision of establishing a pervasive culture among DoD's scientists and engineers where they routinely use advanced computational environments to solve the most demanding problems. Often, DoD HPC users cannot tell whether they are interacting with PET on-site staff or ASC MSRC staff when seeking assistance on using HPCMP resources. Both groups are dedicated to delivering top-notch quality support to DoD users through a friendly can-do attitude, as they also seek opportunities to bring new customers into the DoD HPCMP.

As a result, PET and the ASC MSRC look for opportunities to leverage each other's capabilities to improve support to HPC users. For instance, the ASC MSRC, as well as other MSRCs and DoD sites, host the PET on-site staff in their facility, providing office space and access to computer resources. This enables the PET on-site staff to be close to their user communities and to the computational equipment that their communities often utilize. The ASC MSRC also provides classroom space for hosting PET-funded training courses. In return, PET assists the ASC MSRC in providing advanced help desk support and shares information regarding user needs and desires with the MSRC staff. PET also works with the ASC MSRC to support new technologies being transferred to the DoD.

But aside from these similarities, there are some significant differences between these two components of the HPCMP. The ASC MSRC concentrates on delivering a "world class" capability that applies high performance computation toward solving DoD problems. This world-class capability includes providing a full range of hardware, software, data storage, archiving, visualization, training, and knowledgeable resources in specific omputational technology areas.



On the other hand, PET's mission is to gather and deploy the best ideas, algorithms, and software tools emerging from the national HPC infrastructure into the DoD user community. The mission is accomplished through four means - transferring innovative HPC technologies into the user community; improving the computing/programming environment at the MSRCs and shared resource centers; facilitating collaborative activities with academia, government and industry; and offering training on HPC-related applications, languages, and environments.

It is important to note that no matter where they are located, PET on-site staff can be called upon to assist any of the MSRCs, shared resource centers, and other DoD sites in addressing DoD users needs. For instance, if a Climate/Weather/Ocean Modeling and Simulation (CWO) user calls the ASC MSRC Service Center about an issue, the Service Center staff can contact any of the PET CWO on-sites for assistance. Likewise, PET staff may also direct users to any MSRC or shared resource centers that can best meet their computational needs. This close working relationship between PET and the ASC MSRC enables each of them to better serve the DoD HPC user community than they could otherwise do alone. So whether working with PET on-sites or center staffs, customers can be assured that both stand ready to serve them.

For additional information on the PET program, please visit the PET Online Knowledge Center (OKC) (https://okc.erdc.hpc.mil). Questions regarding the ASC MSRC should be forwarded to the ASC MSRC Service Center at msrchelp@asc.hpc.mil, or (888) 677-2272 or (937) 255-1094.

Simplifying and Evaluating Threat and Target Models for Constructive and Virtual Simulations

It's Not Your Typical Video Game

This research was made possible through support provided by DoD HPCMP PET activities through Mississippi State University (MSU) under contract number N62306-01-D-7110.

Researchers:
Philip Amburn, SAIC
Thomas Broadstock, SAIC
Michael Chupa, MSU
Richard Luczak, SAIC
Jamie Moyers, SAIC
Richard Schumeyer, MSU
Tim Menke, ASC/XR
Robert Moorhead, MSU
David R. Pratt, SAIC

A growing emphasis on joint operations and network centric warfare is placing requirements on Acquisition and Test and Evaluation (T&E) organizations that make Modeling and Simulation (M&S) capabilities increasingly important.

An important element of M&S is to create, display, and effectively use realistic synthetic battlespace environments and this requires managing the complexity of the objects within the scene in multiple modalities. These battlespace environments are used in constructive and virtual simulation applications, such as weapon system design, vulnerability analysis, and many aspects of T&E. Traditionally, creating models with levels of detail and with agreement in different spectral bands is a time-consuming process dominated by human effort.

To assist in this process, researchers and scientists have implemented an automated process for taking high fidelity polygonal models of battlefield objects and reducing the polygon count, while working to manage multi-spectral agreement. This task involves several challenging issues, including 1) where and how to find the needed geometric models, 2) is a geometric model good enough for the task and how to measure good enough,
3) how to compare one geometric model to another, 4) geometric model agreement in multi-spectral imagery, and 5) how to minimize duplication of effort when creating and evaluating geometric models.

Simplifying 3D Geometric Models

This project was established to create a software tool, which is called *simplify*, to take high-fidelity 3D geometry descriptions, create new 3D geometry descriptions with reduced polygon counts, and evaluate the candidate geometries in visible light, RADAR, and IR imaging.

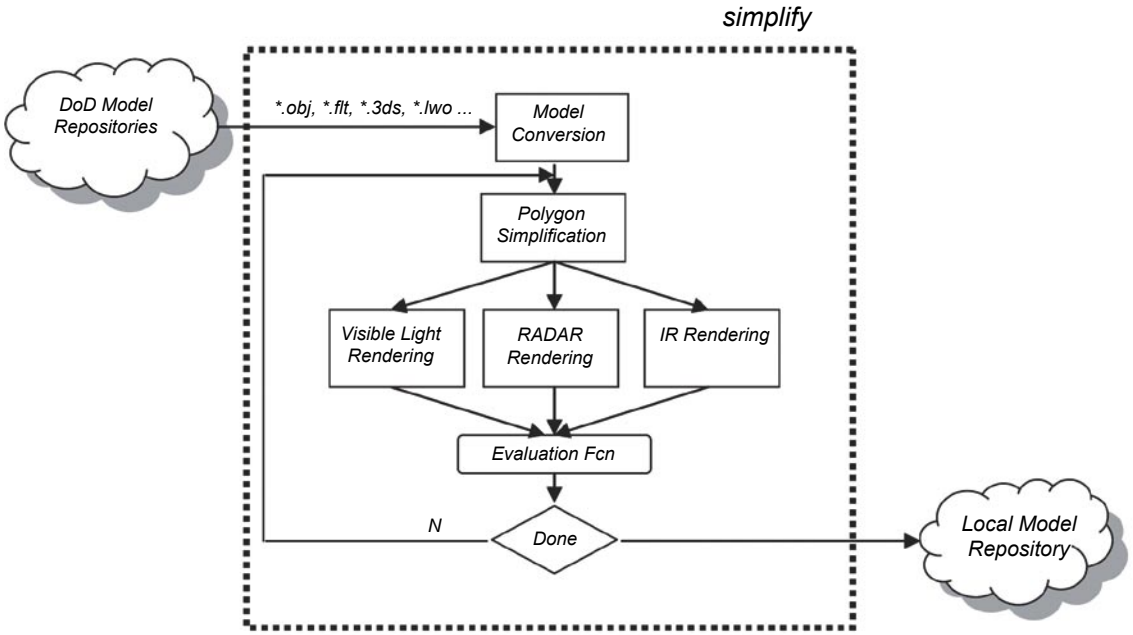


Figure 1. Simplify Pipeline

Simplify is needed to ease the transition of what could be perceived as notoriously difficult-to-use HPC resources, to an easier point and click style interface. A pseudo-interactive interface is used to

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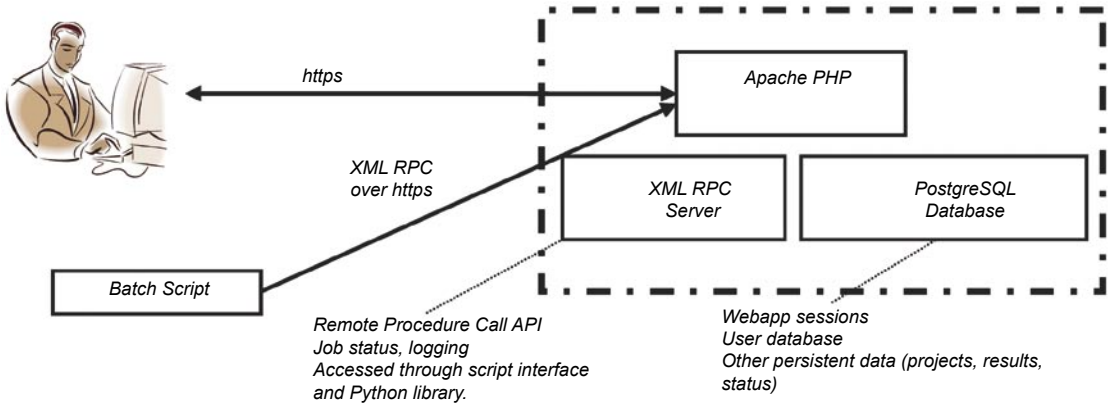

Figure 2. Simplify Infrastructure

ease the transition to HPC use. The HPC resources are used to create and evaluate candidate geometry, with RADAR and IR rendering being used as computationally intensive. The software tool developed is a pipeline process, as shown in Figure 1.

High fidelity 3D polygonal models of threats and targets are processed through this pipline. These models come from several sources in a wide variety of formats, such as OpenFlight, Wavefront OBJ, ACAD facet, and others. Consequently, translation between geometry formats is sometimes needed.

To address the ease-of-use issue and provide a pseudo-interactive interface, the team developed a web-based interface using well established technology identified as LAMP (**L**inux, **A**pache, **M**ySQL and **P** can indicate PHP, Python or Perl). Figure 2 depicts the underlying infrastructure, built with LAMP, that supports the *simplify* system. PHP was used to create the graphical user interface (GUI). PHP is a server-side, HTML-embedded scripting language used to create dynamic web pages. Once the *simplify* run is setup through the GUI pages, the parameters and necessary batch scripts are sent to HPC resources, which provide job status information back to the user through XML RPC calls. Underlying RDBMS support, to store persistent data between runs, is provided by PostgreSQL rather than MySQL solely as a matter of choice. The user can then logoff and let the *simplify* process continue. Because the PostgreSQL database maintains job status information, the user can logon later, and check on the progress of the tasks. All of these tools are Open Source or Freeware and are readily portable. A distinct benefit of the web-based interface is easy access to *simplify* from any computer/OS combination with a web browser.

Project Status

Users connect to *simplify* hosted on a web server in the SAIC Orlando, Florida offices. This web server provides the LAMP support, and the GUI can be accessed through any web browser. After specifying the parameters for the *simplify* project (or run), the user can submit the project to the SGI Origin 3900 at the ASC MSRC. All of the HPC support for *simplify* is currently through this SGI machine that uses the LSF batch system.

A Look to the Future

There is a good deal more work to be done in using metrics to evaluate candidate geometric models. The current set of metrics may provide a good basis for identifying usable models, but other metrics may be needed. Creating a truth data set that associates quality assessments of models with metrics is urgently needed. Eventually, this should include a human factors experiment with military operators providing the subjective evaluation.

Another topic for future work is to expand the idea of a model pedigree. There is on-going work in this area to collect that information in a distributed database among cooperating DoD model repositories.

Please contact Dr. Phil Amburn via email at Philip.Amburn@wpafb.af.mil for more complete information regarding this on-going effort.

PET Provides Training to DoD HPC Users

By Brian Schafer

One of the key roles of the DoD HPCMP PET component is to provide training to the DoD HPC user community on how to best use the application software, computational environment, utilities, and visualization tools provided by the DoD HPCMP. To fulfill this role, PET conducts a wide variety of courses throughout the year to meet the training needs of DoD RDT&E communities using HPC. At no cost to attendees, these courses are offered at DoD locations across the United States and generally focus on HPC software tools and applications supporting the ten computational technology areas, e.g., Fluent for Computational Fluid Dynamics (CFD) users or Accelrys for Computational Chemistry, Biology, and Materials Science (CCM) users. Courses in programming and productivity tools, such as MATLAB for scientific/engineering programming, EnSight for Scientific Visualization or MPI for parallel programming are also taught. These courses are tailored toward introductory, intermediate, or advanced users.

So how can you find out more information about training opportunities offered by PET? The PET Online Knowledge Center (OKC) is the "one-stop shopping" site where you can find out what PET courses are being taught, and then register to take these courses. You can also obtain information on previously taught courses. To access the OKC, go to https://okc.erdc.hpc.mil. Before you can register for a course, you will first need to apply for and then login to your OKC account. While creating your OKC account, you can also elect to receive email notifications on upcoming training courses in areas in which you are interested. When registering for a course, you will be asked your four-digit HPCMP requirements project number. To obtain your HPCMP project number, you may contact the Accounts Center or Help Desk where your HPC account is homed.

Not everyone is available to travel and attend a PET course. Fortunately, there are three options for these folks to take advantage of PET training; live webcast, download/delayed webcast, and ordering a CD. A number of PET courses are available via webcasting over the Internet. Webcasted courses are listed along with all other upcoming PET training. You would register for this course as you would for other PET courses.

In addition, the OKC also hosts training courses that have been captured for reuse. These courses may be streamed over the Internet to your computer for viewing using Real Player. Many of the captured courses are available as a downloadable disk image (iso) that you can save to your hard drive and burn to CD. If downloading a disk image is not practical, you can order a CD copy online that will be sent to you via regular mail.

So what if you searched the OKC and cannot find a course you require? Users on active DoD HPC projects have the opportunity to make their training needs known through the DoD HPCMP user requirements survey. Your project's principal investigator (PI) collects this information annually to help complete the survey. This survey is used to determine what future PET-sponsored training should be offered. Training provided by PET is vetted against the requirements in the HPCMP user requirements database.

Meeting your training needs continues to remain important to PET. If you have any questions related to PET-sponsored courses, please feel free to submit your request via the OKC Feedback Form or send an email to the OKC at PET-OKC@erdc.usace.army.mil.

Upcoming Conferences

June 27 - 30, 2005
DoD Users Group Conference
Gaylord Opryland Resort and Convention Center
Nashville, Tennessee
www.hpcmo.hpc.mil/Htdocs/UGC/UGC05

July 27 - 28, 2005
On the Use of Commodity Clusters for Large-Scale Scientific Applications
Greenbelt Marriott
Greenbelt, Maryland
www.arl.hpc.mil/events/Clusters2005

July 31 - August 4, 2005
SIGGRAPH2005
Los Angeles Convention Center
Los Angeles, California
www.siggraph.org/s2005

September 26 - 28, 2005
HPC User Forum Meeting
Oak Ridge, Tennessee
www.hpcuserforum.com

September 27 - 30, 2005
Cluster 2005
Burlington Marriott
Burlington, Massachusetts
www.cluster2005.org

October 23 - 28, 2005
IEEE VIS 2005
Minneapolis Hilton
Minneapolis-Saint Paul, Minnesota
vis.computer.org/vis2005

November 12 - 18, 2005
Supercomputing Conference 2005
Washington State Convention and Trade Center
Seattle, Washington
www.sc05.supercomputing.org

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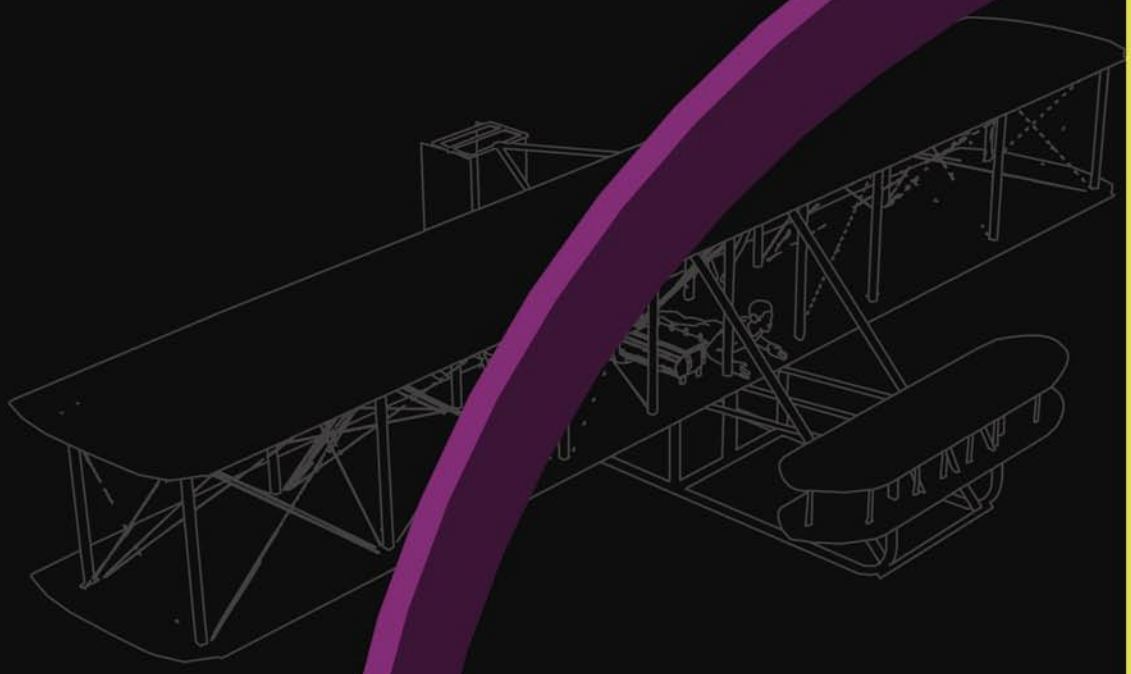

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